

Research Article

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Effect of biozyme^(R) on soil and crop biometrics in rice-wheat system

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Summary

A registered product biozyme is extracted from a Norwegian Sea weed known as *Ascophyllum nodosum*. It is biodegradable and non-toxic for the plant and soil health as claimed by Biostadt company. Beside biozyme, several other zymes are also available in the market with some prefixes in the name. They claim, the zyme is toxin free, eco-friendly, bio degradable product containing growth hormones, elements, minerals and vitamins. Highly compatible with fertilizers and pesticides, it also increases the resistance of plants against various pests, diseases and climatic stress. These zymes are available in solid and liquid form and are being used as either top dressing or spraying on the crop canopy at important crop growth stages. As per some earlier studies, biozyme have claimed to have beneficial in crop growth both in vegetative part as well as in grain production. Keeping in view of its importance a field trial was formulated and being conducted in research farm of Bihar Agricultural University Bhagalpur (Bihar) to see the impact of Biozyme on the yield and soil microbes.

Key words : Biozyme, Soil, Crop biometrics, Yield, Economics

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Introduction

Few private organizations are working and marketing bio degradable products in the market known as zyme with some prefixes in the name. They are claiming that zyme is toxin free eco-friendly bio-degradable product containing growth hormones, elements, minerals and vitamins. Formulated using advanced bio-technologies and quality assured ingredients, it is used for higher yields and effective growth of plants and agricultural produces. Highly compatible with fertilizers and pesticides, it also increases

the resistance of plants against various pests, diseases and climatic stress.

Soil application and foliar sprays of biozyme, a commercial product biologically derived from were studied on French bean cv 'CONTENDER' by Rana *et al.* (2006). They found that imposition of biozyme treatments brought about significant effect on yield and yield contributing characters of French bean. They also observed that the increase in biozyme levels through soil application increased the number of pods per plant and number of grains per pod which further resulted in

increased seed and straw yields over control. Pandidurai *et al.* (1998) also observed higher plant root and shoot growth and also number of leaves after application of biozyme in tea crop. Karanja *et al.* (2013a) revealed that 750 ml/ha biozyme® significantly ($P<0.05$) increased total potato tuber yields by 3x to 7x, reduced unmarketable tubers by up to 3x, enhanced dry matter by 10 per cent and starch by >2x compared to the 0 ml/ha biozyme®. Similar effect on potato was also observed by Karanja *et al.* (2013b). Total fruit set was recorded more in pomegranate cv. KANDHARI KABULI when biozyme was applied (Abubakar *et al.*, 2013). Objective of the present experiment was finalized to test the effect of biozyme power plus granules and liquid on paddy and wheat crop in Sabour in Bihar Agricultural University experimental site.

Resource and Research Methods

Keeping in view of its importance a field trial was formulated and being conducted in research farm of Bihar Agricultural University Bhagalpur (Bihar) to see its impact on the yield and soil microbes and environment. The experiment had 7 treatments with 3 replications. Treatments included different doses of NPK and NPK + biozyme with absolute control in rice and wheat crops.

Evaluation of growth and yield attributes of paddy with application of biozyme :

Paddy (var. Rajendra Mansuri) was transplanted in the experimental plot of Bihar Agricultural University, Sabour on 18.7.2013. Experimental details were as follows:

Design : Randomized Block Design (RBD)
Replications : 3
Treatments : 7

Variety : Rajendra Mansuri
Plot size : 3m x 7m
Test sample: Biozyme power plus granule and biozyme power plus liquid

Evaluation of growth and yield attributes of wheat with application of biozyme :

Details of experiment :

Evaluation of biozyme grain plus granule and biozyme crop plus liquid on wheat

Design: Randomized Block Design (RBD)
Replications: 3
Treatments: 7
Date of sowing: 5.12.2013
Variety: HD 2967
Plot size: 3m x 7m
Test sample: Biozyme grain plus granule and biozyme crop plus liquid

Treatment details :

T₁ = No fertilizer
T₂ = Recommended Dose of Fertilizer (120:60:40)
T₃ = RDF + biozyme grain + @20 kg/ha at basal, biozyme crop + @500 ml/ha at panicle initiation stage and biozyme crop + @ 500 ml/ha at milking stage
T₄ = RDF + biozyme grain + @20 kg/ha at tillering stage, biozyme crop + 500 ml/ha at panicle initiation stage and biozyme crop @ 500 ml/ha at milking stage
T₅ = RDF + biozyme grain + @20 kg/ha at tillering stage, biozyme crop + @ 500 ml/ha at CRI stage, biozyme crop + 500 ml/ha at panicle initiation stage and biozyme crop + @ 500 ml/ha at milking stage

Table A: Treatment details				
Treatments	Basal dose	Tillering stage	Panicle initiation stage	Milking / grain filling stage
T ₁ No fertilizer	-	-	-	-
T ₂ RDF only	50%N, 100%PK	25%N	25%N	-
T ₃ RDF+	50%N, 100%PK + biozyme power + granule @ 15 kg/ha	25%N+ biozyme power + @ 15 kg/ha	25%N	-
T ₄ RDF+	50%N, 100%PK	25%N	25%N + biozyme power + liq. @ 625 ml/ha	Biozyme power + liq. @ 625 ml/ha
T ₅ RDF+	50%N, 100%PK	25%N + biozyme power + granule @ 15 kg/ha	25%N + biozyme power + liq. @ 625 ml/ha	Biozyme power + liq. @ 625 ml/ha
T ₆ RDF+	50%N, 100%PK + biozyme power + granule @ 15 kg/ha	25%N + biozyme power + granule @ 15 kg/ha	25%N + biozyme power + liq. @ 625 ml/ha	Biozyme power + liq. @ 625 ml/ha
T ₇ 150% RDF	50%N, 100%PK	25%N	25%N	-

RDF = Recommended Dose of Fertilizer (100:40:20)

Biozyme granule can be mix with any inorganic fertilizer

T₆ = 150 % of RDF: 50 % N and 100 % PK as basal dose, 25 % N at CRI stage and 25 % N at jointing stage

T₇ = 150 % of RDF: 25% N and 100% PK as basal dose, 25% N at CRI stage and 25% N at tillering stage and 25% at panicle initiation stage.

Research Findings and Discussion

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Mode of action (as claimed by manufacturer) :

Biozyme stimulate the plant growth by providing nutritional support to the plant.

The seaweed *Ascophyllum nodosum* is known source of plant growth stimulating substances, which exhibits cytokinins and auxins like effects and other compounds in the seaweeds like carbohydrates, amino acids, algenic acid, organic osmolites (Betains), mineral nutrients, vitamins and vitamin precursors, play a vital role in plant growth and plant defence mechanism.

Application of biozyme preferably at early crop stage results in strong, sturdy and healthy plant in vegetative stage.

The application at flowering stage/peak flowering/ fruit setting and fruit development stage results in significantly increased high quality produce.

A study shows that application of biozyme increases dry matter production and grain yield by improving nutrient use efficiency (Campos *et al.*, 1994 and Belakbir *et al.*, 1998).

Out of the above 7 treatments, biozyme was applied only in 4 treatments *viz.*, T₃, T₄, T₅ and T₆. Other

treatments were kept for relative comparison purpose. There were 2 form of biozyme: 1. Liquid form: Biozyme power plus liquid and 2. Granular form: Biozyme power plus. Treatment T₃ was given only granular form of biozyme whereas treatment T₄ was given only liquid form of biozyme. Both form of biozyme, liquid and granular were used in T₅ and T₆. T₆ was given maximum quantity of biozyme among all the treatments.

Biozyme effect on paddy yield :

Variation in relation to different growth and yield attributes were observed on paddy among the treatments. Those plots treated with biozyme resulted significant superior growth and yield attributes over absolute control. When mixed with recommended dose of fertilizers (RDF), biozyme treated plots also recorded better performance over the plots treated with RDF only. Among the biozyme treatments, T₆ (RDF + biozyme power plus+ @ 15 kg/ha at basal dose and tillering stage, biozyme power + @ 625ml/ha at CRI stage, biozyme power + @ 625 ml/ha at panicle initiation stage and at milking stage) produced the highest grain yield followed by T₅ and T₄, respectively. T₆ yielded 13.35 per cent more than RDF (Table 2).

Cost benefit ratio of biozyme over RDF for one hectare paddy:

Formula= Additional income/ additional expense (product+ labour)

Product cost (biozyme power plus @ 15 kg @ Rs. 655 and power plus 625ml ml @ Rs. 400)

Labour cost per labours/day @ Rs 173.00/day

Rate of paddy =Rs. 1500.00/quintal

As per above table, the C: B ratio of biozyme applied treatments over RDF were:

For T₅ (RDF+ 15kg power plus granule and 625 ml

Treatments	Organic carbon (%)	Available N (kg/ha)	Available P ₂ O ₅ (kg/ha)	Available K ₂ O (kg/ha)
T ₁	0.35	192.45	26.70	163.90
T ₂	0.37	200.37	28.27	172.03
T ₃	0.38	200.20	27.43	169.70
T ₄	0.37	199.20	28.93	171.53
T ₅	0.38	198.67	28.23	170.67
T ₆	0.37	202.97	28.53	172.50
T ₇	0.39	202.67	28.67	172.30
S.E.±	0.019	4.303	1.541	3.561
C.D. (P=0.05)	0.058	13.257	4.747	10.971
C.V.	8.850	3.733	9.493	3.620



Fig. 1 : Showing biozyme



Fig. 2 : Spraying biozyme



Fig. 3 : With/without biozyme crop

Table 2 : Crop biometrics of paddy after using biozyme

Treatments	Plant height (cm)	Grain yield (q/ha)	No. of effective tillers/m ²	Straw yield (q/ha)	1000 grain wt. (g)	Ear length (cm)
T ₁	101.60	51.70	11.47	57.40	26.94	22.48
T ₂	115.00	61.40	18.47	68.53	27.96	24.96
T ₃	114.27	65.56	19.13	74.08	28.20	25.39
T ₄	116.60	65.65	19.27	74.72	28.65	25.81
T ₅	116.13	67.90	19.80	75.83	29.01	26.99
T ₆	117.40	69.60	19.53	76.23	29.04	26.25
T ₇	125.60	70.41	20.60	77.18	29.07	26.85
S.E.±	1.517	1.602	0.590	2.365	0.211	0.395
C.D. (P=0.05)	4.674	4.935	1.816	7.285	0.650	1.218
C.V.	2.280	4.294	5.571	5.687	1.285	2.681

Table 3 : Soil status after harvest of wheat

Treatments	Organic carbon (%)	Available N (kg/ha)	Available P ₂ O ₅ (kg/ha)	Available K ₂ O (kg/ha)
T ₁	0.33	179.55	25.90	161.90
T ₂	0.37	200.77	29.40	171.20
T ₃	0.38	199.87	28.77	170.87
T ₄	0.37	200.63	28.90	172.27
T ₅	0.39	200.33	27.70	170.90
T ₆	0.38	203.83	28.60	172.33
T ₇	0.39	202.80	28.90	172.43
S.E.±	0.023	4.341	1.657	3.393
C.D. (P=0.05)	0.069	13.375	5.106	10.454
C.V.	10.411	3.785	10.146	3.445

power plus liquid twice)

Total product cost = 655 + 400 + 400 = Rs. 1455

Total labour cost = 173.00 x 4 = Rs. 692

Total additional cost over RDF = (1455 + 692) = Rs. 2147

Additional yield over RDF (Table 1) = 6.5 q.

Additional income over RDF = 6.5 x 1500 = Rs. 9750

C:B ratio = (9750/2147) = 1:4.54

Similarly for other treatments C:B ratios are :

T₃ = 1:4.01

T₄ = 1:4.93

T₆ = 1:4.13

Variation in relation to different growth and yield attributes were observed on wheat among the treatments. Those plots treated with biozyme resulted significant superior growth and yield attributes over absolute control (Table 4). When mixed with recommended dose of fertilizers (RDF), biozyme treated plots also recorded better performance over the plots treated with RDF only. Among the treatments, T₃ (RDF + biozyme grain + @ 20 kg/ha at basal dose, biozyme crop + @ 500 ml/ha at CRI stage, biozyme crop + 500 ml/ha at panicle initiation stage and biozyme crop + @ 500 ml/ha at milking stage) produced the highest grain yield followed by T₄, T₅ and T₇, respectively. T₃ recorded 15.06 per cent yield increase over RDF

A field study conducted by Rana *et al.* (2006):

- Increase in biozyme levels through soil application
- Increased the number of pods per plant
- Increased number of grains per pod

–Increased seed and straw yields over control.

–Application of biozyme @ 40 kg/ha resulted an economic gain of Rs. 8283/- over control.

–Foliar spray resulted higher seed and straw yields.

–Two sprays (*viz.*, one each at one month after sowing and at pre flowering stage) being statistically similar to three sprays schedule (*viz.*, one each at one month after sowing followed by at early flowering stage and at early grain filling stage).

–Three foliar sprays increased seed yield by 19.9 per cent and economic gain of Rs. 19,848/- over no spray application of biozyme.

Pandidurai *et al.* (1998) observed that biozyme was used as plant growth regulator @ 1000 ppm as foliar nursery spray under polythene hood inside the mist chamber of tissue cultured tea plants. Karanja *et al.* (2013a) and Karanja *et al.* (2013b) showed the response of biozyme for the two consecutive season graphically as: N, P, K and microbial count of soil is being studied as well as yield and yield attributes are also being observed in the current season 2014.

From the above findings It can be said that for better growth and quality, wheat may be treated with biozyme grain plus granule @ 20kg/ha at basal dose and biozyme crop plus liquid at PI and milking stage and for paddy biozyme power plus should be sprayed twice at a dose of 625ml/ha first at tillering stage and finally at milking stage to obtain cost- benefit ratio.

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Table 4 : Crop biometrics of wheat after using biozyme						
Treatments	Plant height (cm)		No. of tillers/m ²	No. of grains/ear	1000 grain wt. (g)	grain yield (q./ha)
	At 30 DAT	At 50 DAT				
T ₁	10.53	22.33	205	49.2	28.63	17.44
T ₂	19.53	33.87	353	54.3	30.91	32.00
T ₃	19.53	33.33	382	61.2	31.53	36.82
T ₄	19.40	33.40	382	61.7	32.53	34.93
T ₅	19.67	34.20	393	60.5	32.01	35.59
T ₆	19.47	33.87	350	59.7	30.99	33.26
T ₇	19.33	33.87	380	60.3	31.07	34.90
S.E.±	0.381	0.328	9.485	3.338	1.702	1.896
C.D. (P=0.05)	1.173	1.010	29.226	10.284	5.243	5.841
C.V.	3.622	1.767	4.703	9.948	9.479	10.216

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